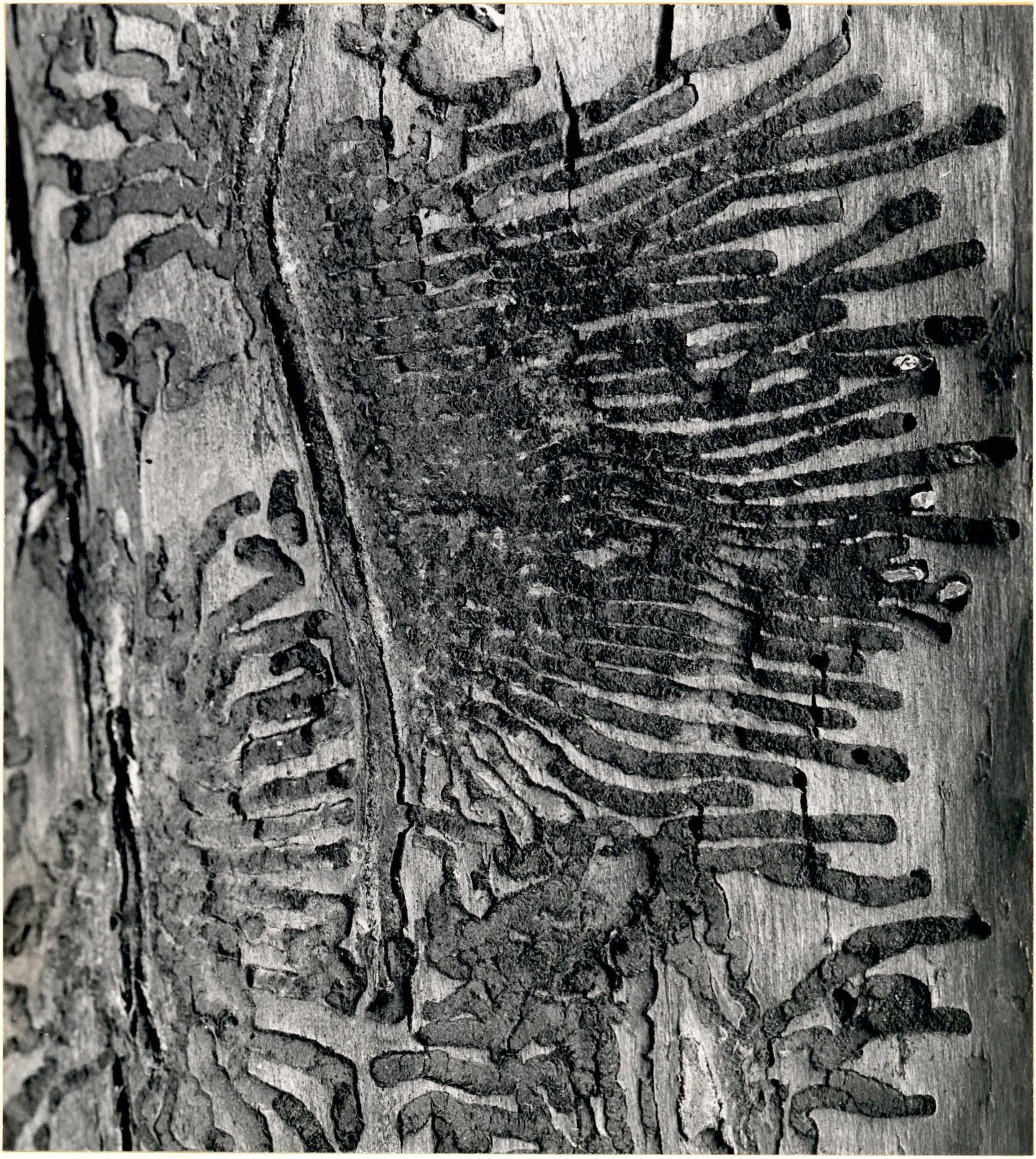
PHOTO ALBUM - II

FOREST INSECT RESEARCH, SURVEYS, AND CONTROL IN OREGON AND WASHINGTON

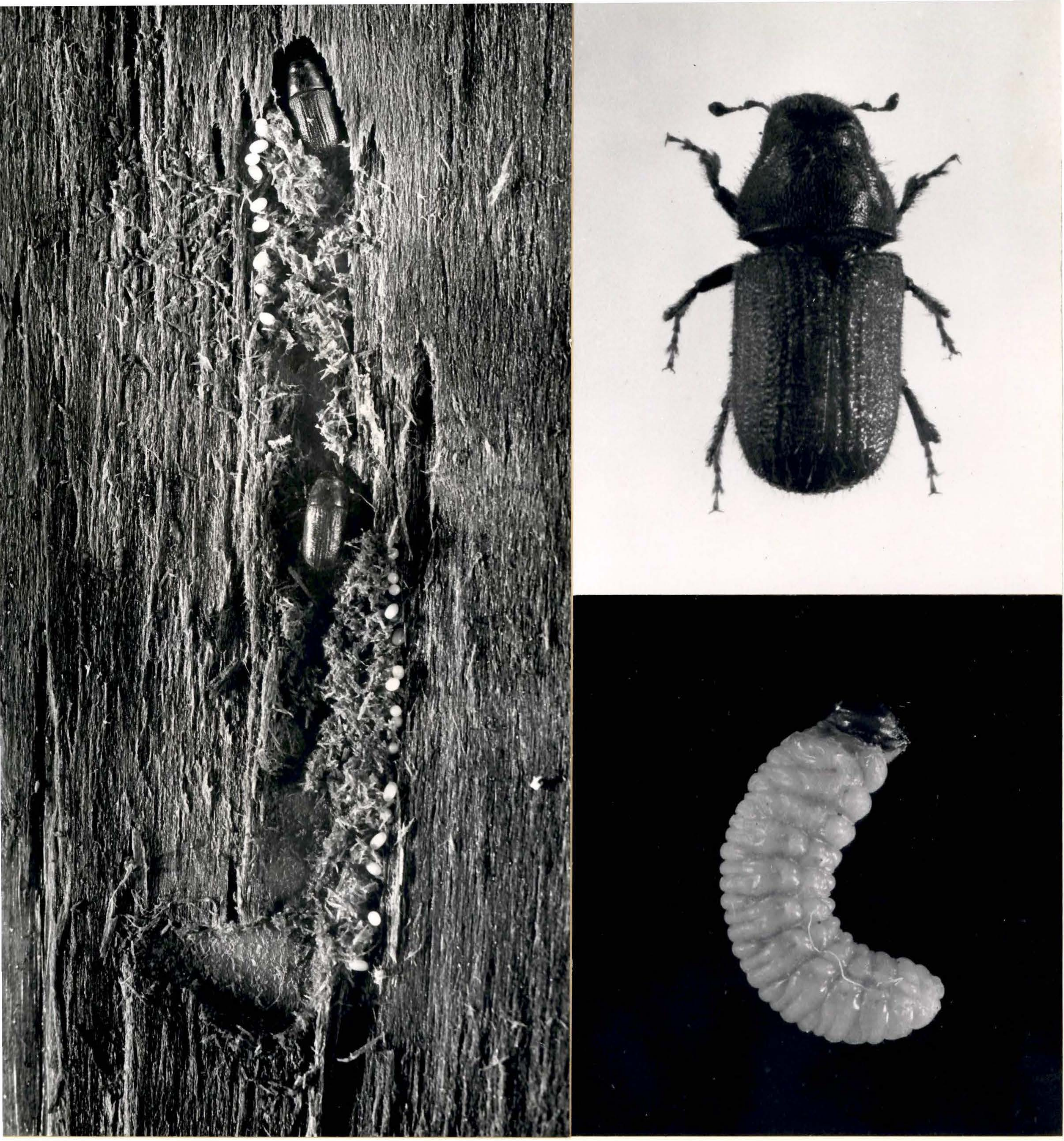
1. Douglas-fir beetle
2. Silver Fir beetles
3. Oregon Pine Ips
4. Sitka Spruce Weevil
5. Hemlock Looper
6. Black-headed Budworm
7. Douglas-fir Tussock Moth
8. Sitka Spruce Aphid
9. Balsam Woolly Aphid
10. Wood Products Insects
11. Seed and Cone Insects
12. Range Insects

Prepared by

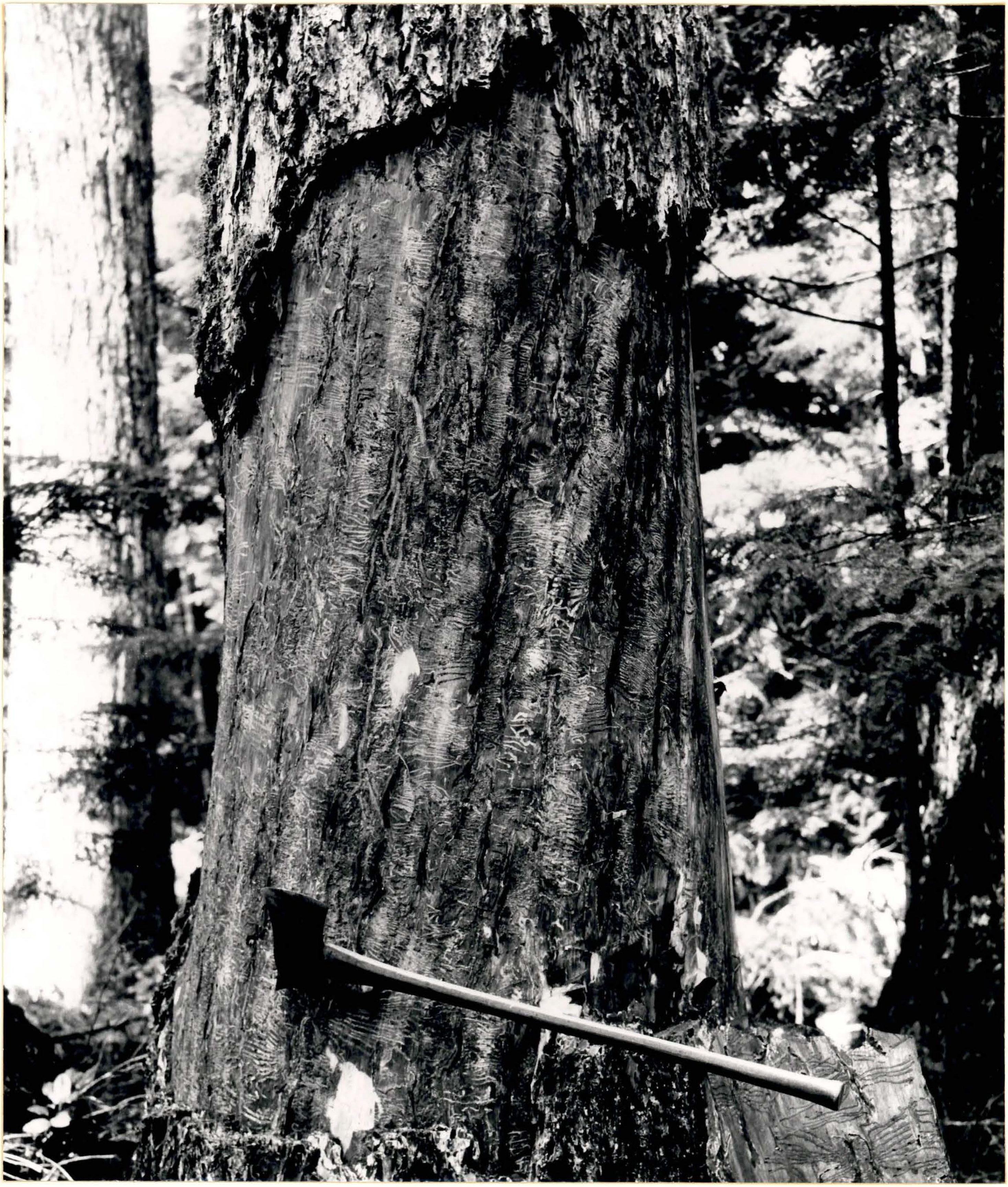
Pacific Northwest Forest and Range Experiment Station
Forest Service
U. S. Department of Agriculture



Galleries of the Douglas-fir beetle on inner surface of bark (natural size).



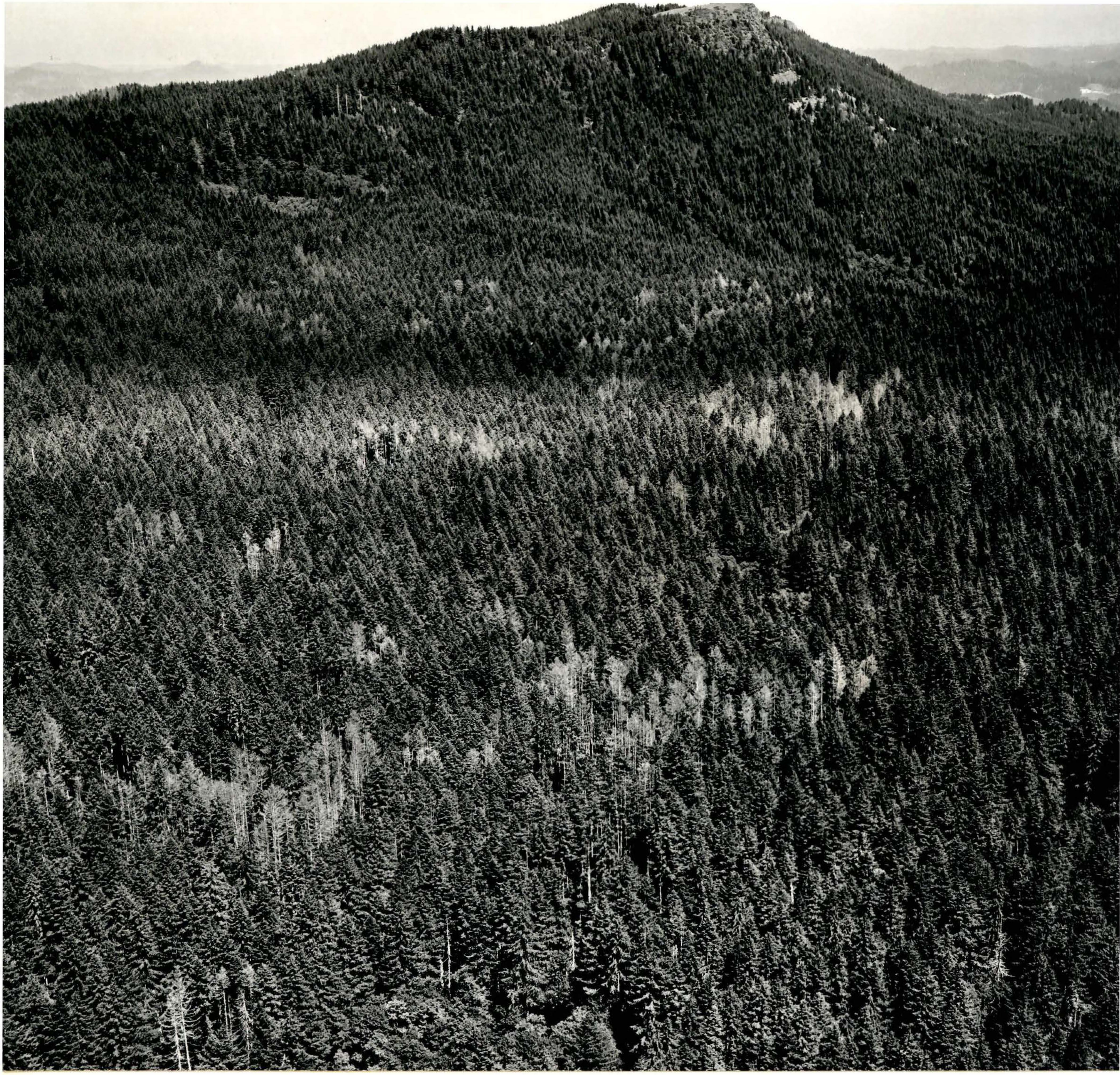
Douglas-Fir Beetle - Left - Pair of beetles laying eggs. Right top - Adult X 13. Right bottom - Larva X 13. Actual size of beetle is 1/4-inch long.



Douglas-fir beetle larvae boring between the bark and wood sever a tree's lifeline. Outbreaks in green timber usually develop in trees killed or weakened by fire, wind, drought, or defoliating insects.

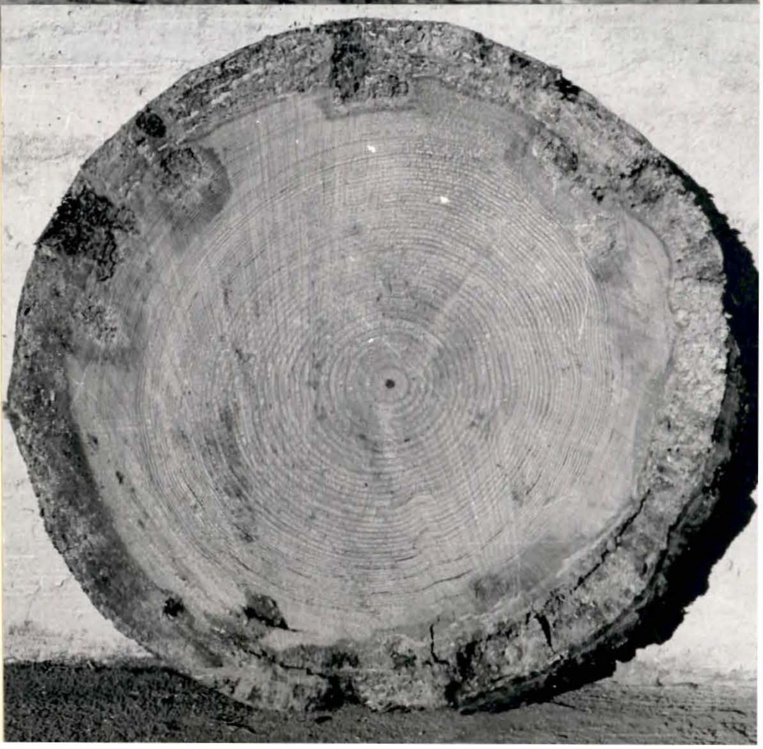
The Douglas-fir beetle breeds abundantly in trees recently killed by fire, often spreading and killing timber extensively around large burns, such as the Tillamook Burn shown above.

Windthrown trees, such as these in Lane County, Oregon, are another important source of Douglas-fir beetle outbreaks.

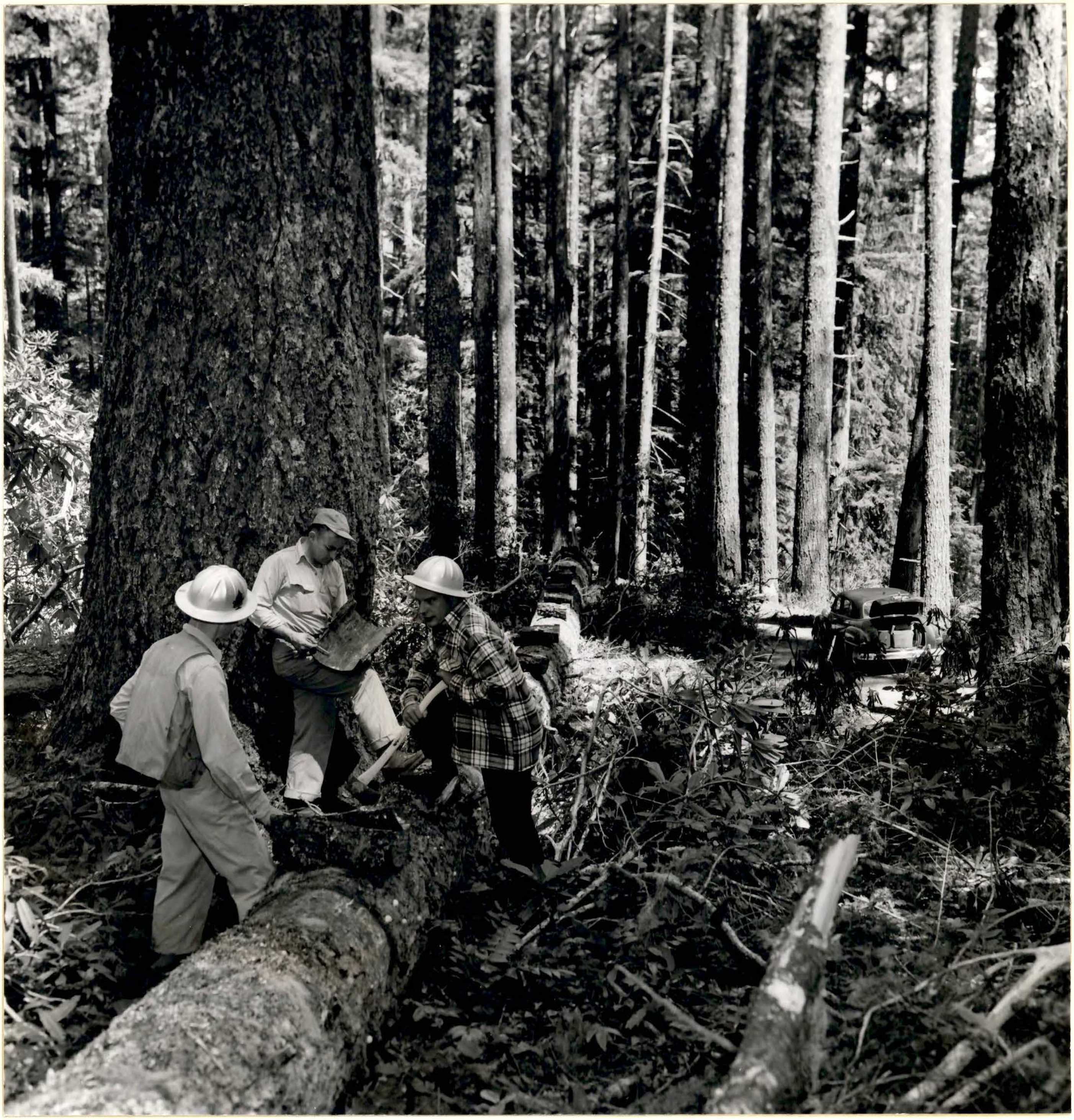


Portion of an Oregon watershed. The groups of light-colored trees were killed by Douglas-fir beetles that bred in wind-thrown trees. 3-1/2 billion board feet of timber was killed in this manner from 1951 through 1954 in western Oregon and Washington.

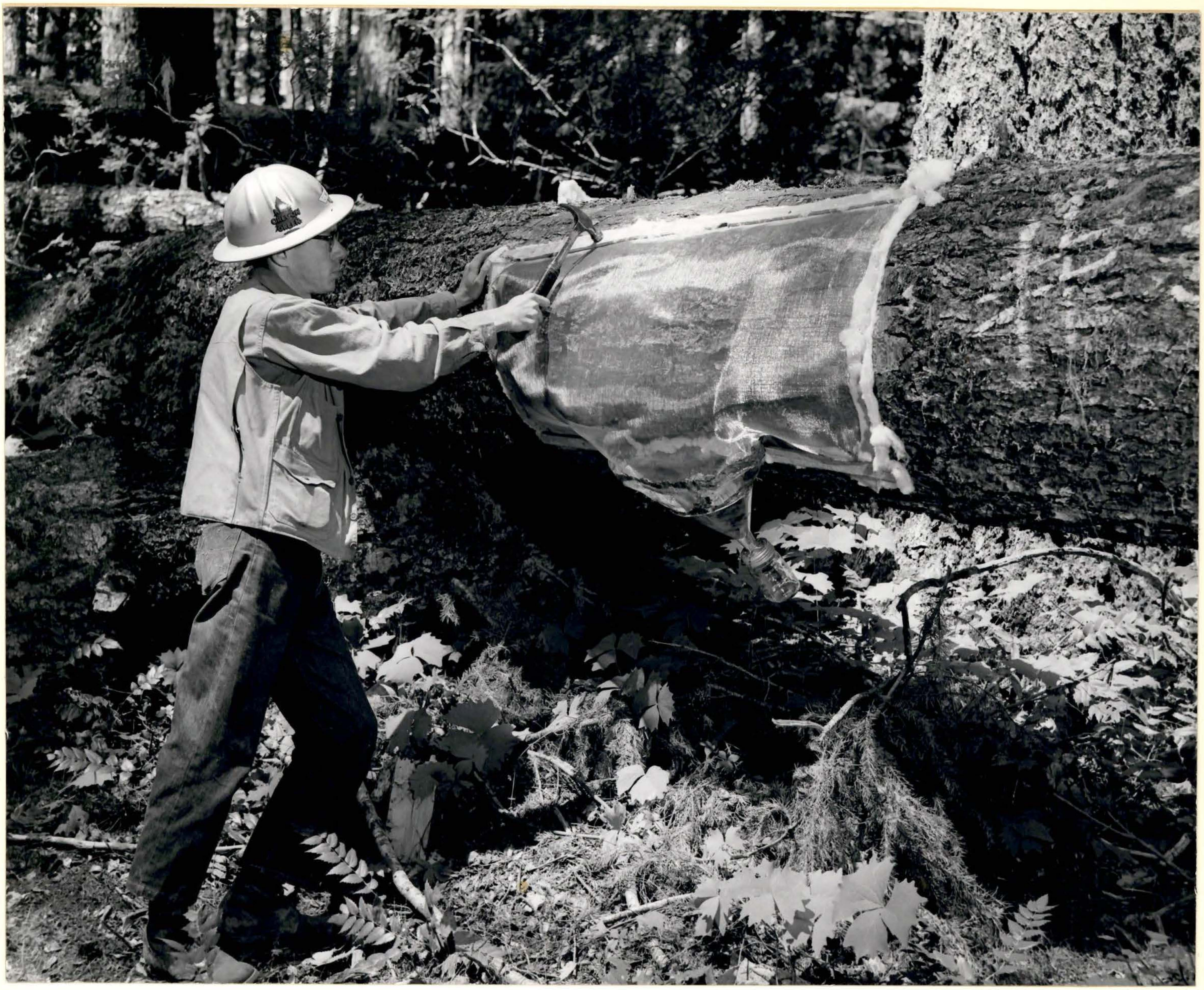
Salvaging beetle-infested trees in Coos County, Oregon. Logging such timber reduces outbreaks of the Douglas-fir beetle by removing large quantities of brood from the woods.



Cross section of a tree 6 years after death caused by beetles. Rot has destroyed the sapwood and part of the heartwood.



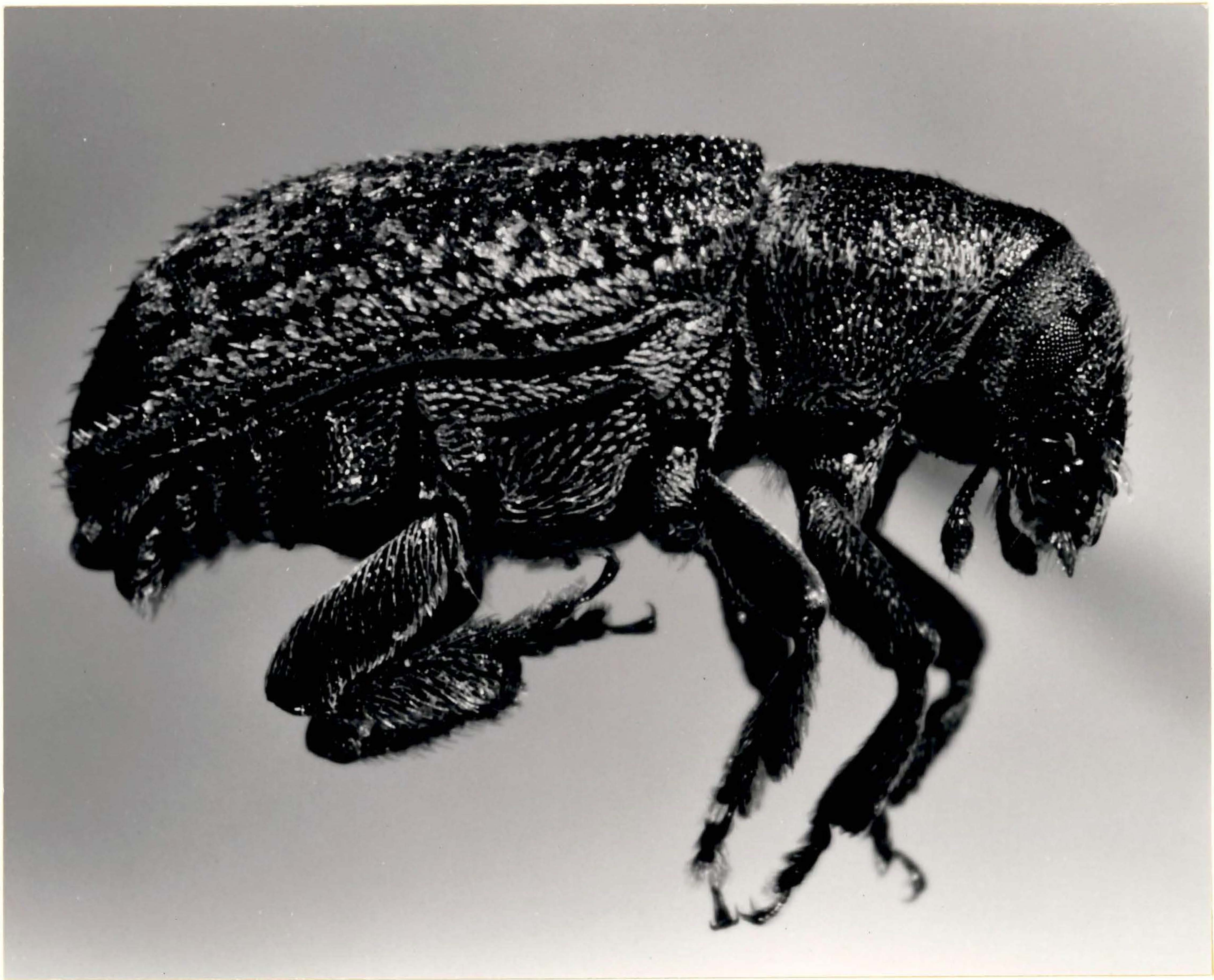
Entomologists examining a windthrown tree in Coos County, Oregon, to determine the population of the Douglas-fir beetle. Sample plots are cruised annually to record the effects of the beetle on this industrial forest.



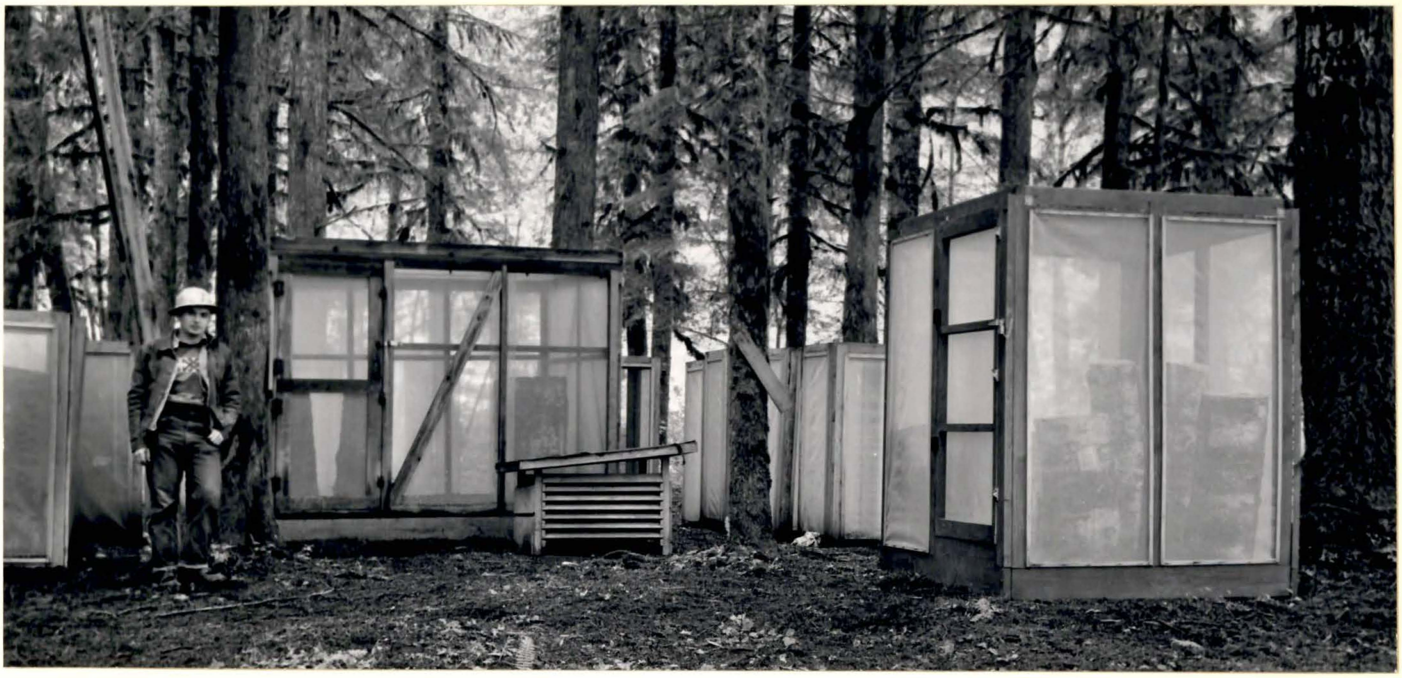
Research worker placing an insect rearing cage on a windthrown tree. Studies of the habits of the Douglas-fir beetle are being made cooperatively by private timber owners, the Oregon Forest Lands Research Center, and the Forest Service.

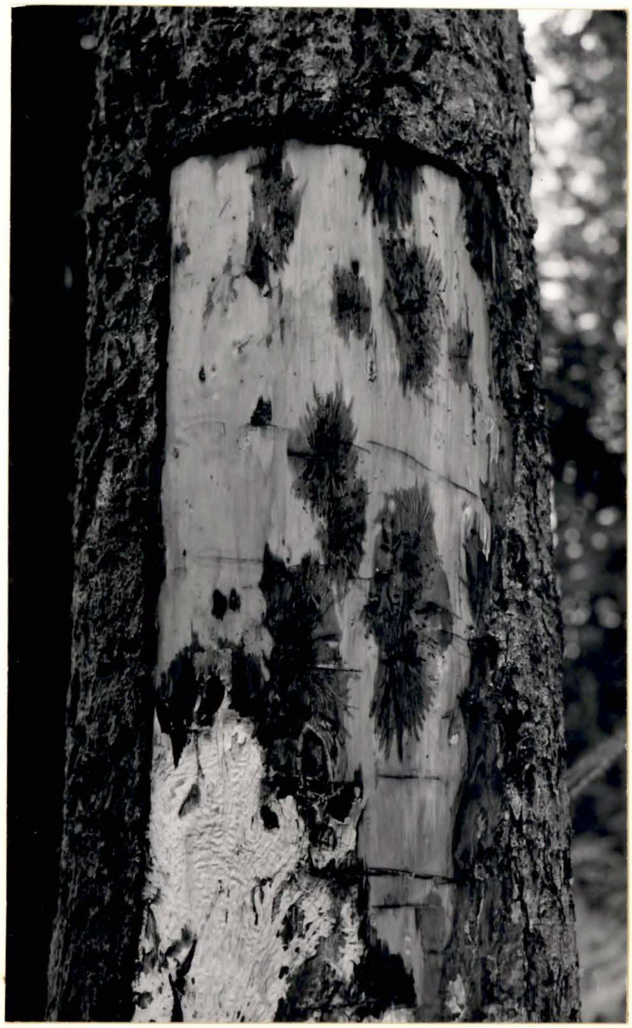
SILVER FIR BEETLES

From 1950 to 1953, more than 500 million board feet of Pacific silver fir in Washington was killed by silver fir beetles (Pseudohylesinus granulatus and P. grandis). Previously these insects were not considered economic pests.



Adult Pseudohylesinus granulatus (X 35)



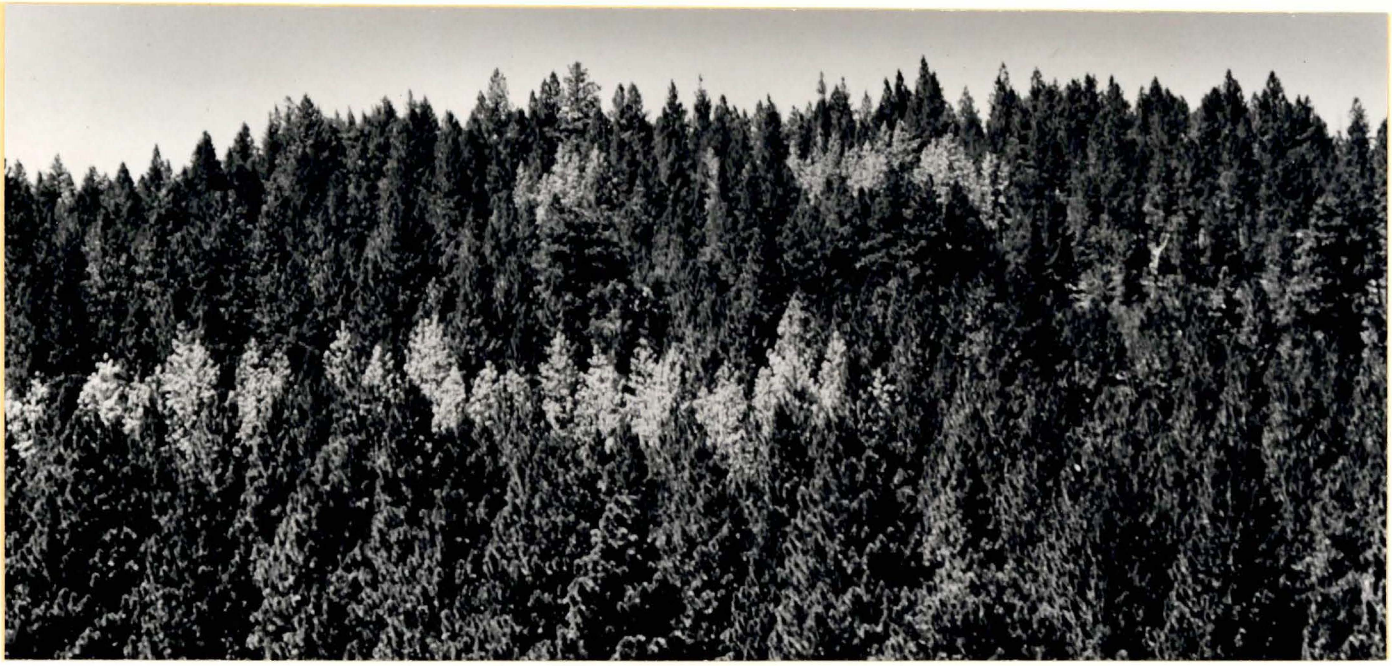


Above - Cages in woods used to study habits of the beetles.

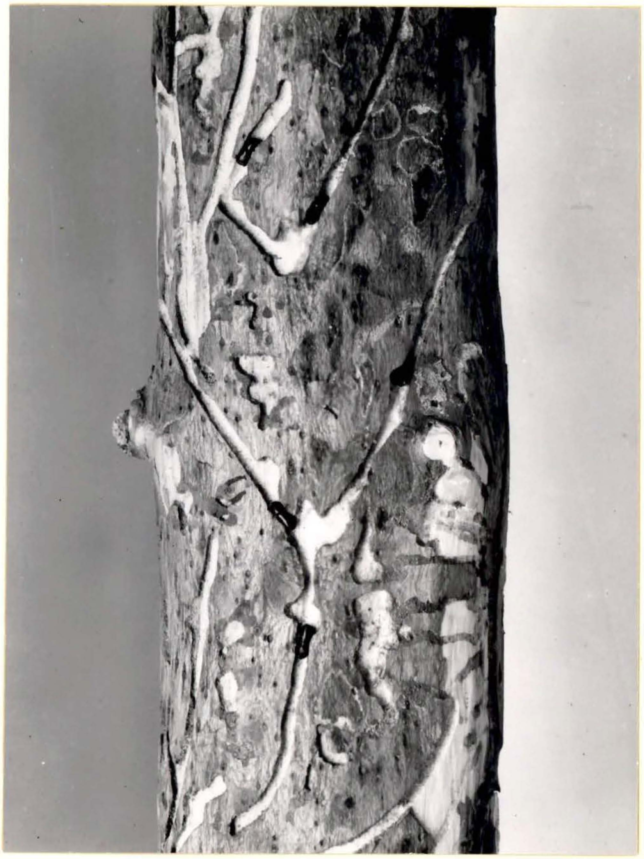
Left - Fungi help the beetles kill trees. The white patch is shoestring fungus that attacks through tree roots. The dark spots are beetle galleries and accompanying brown stain fungus. Study requires concerted efforts of entomologists, pathologists, and other specialists.

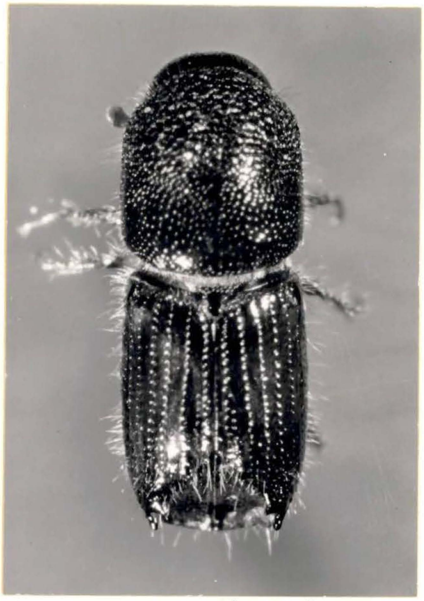
OREGON PINE IPS

Ips often kills young pine extensively following logging, fire, and drought.



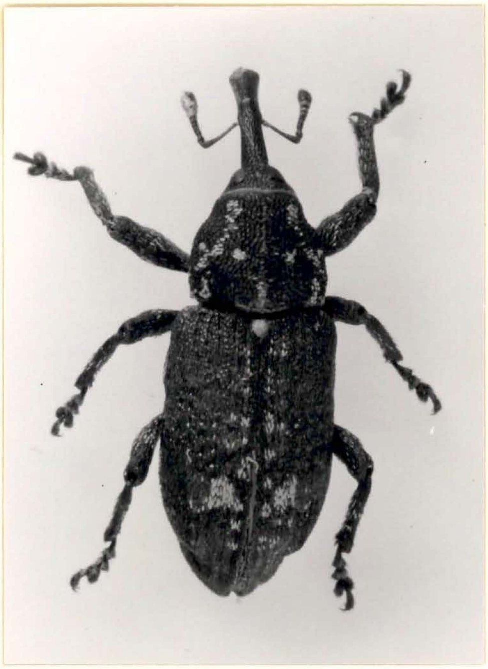
Groups of pole-sized ponderosa pine killed by ips.





Adult - (X 15).

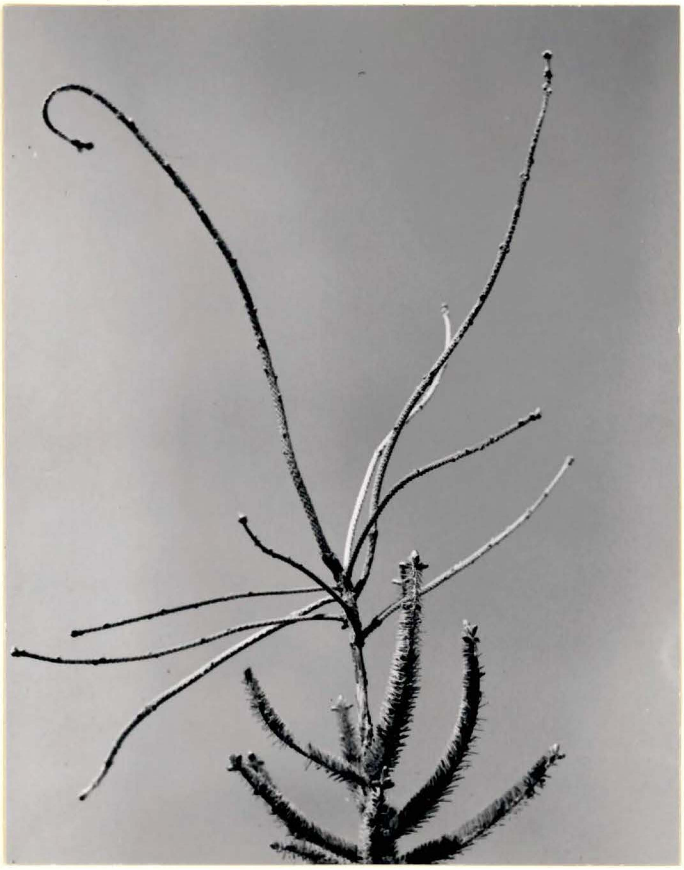
Outer bark removed to show ips adults in egg galleries.



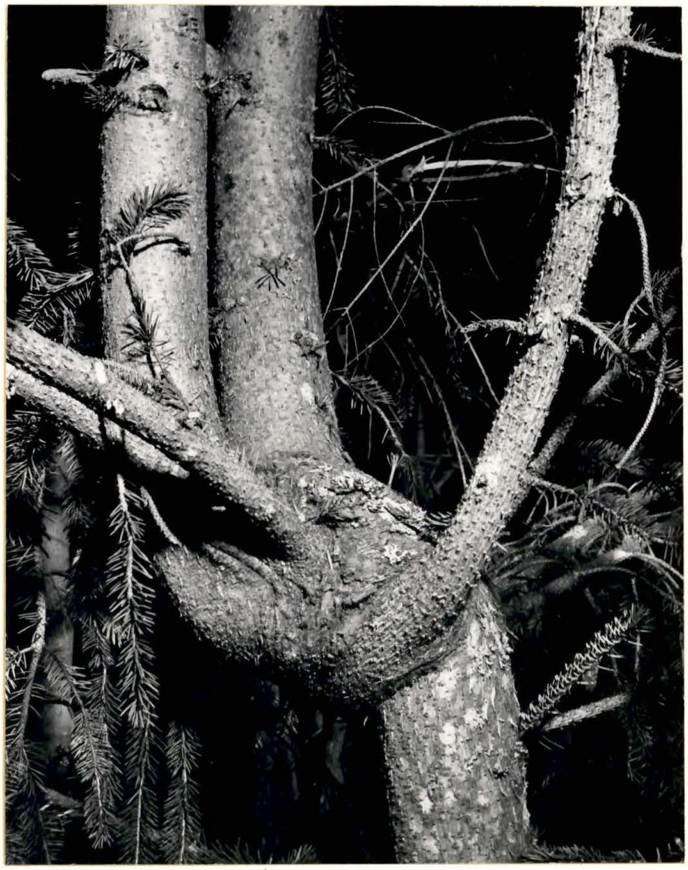
Adult (X 12).

SITKA SPRUCE WEEVIL

This weevil is an important enemy of young Sitka spruce in Oregon and Washington. It attacks and kills or seriously injures the terminal shoots or "leader" of 10 to 30-year old spruce. Forked tops and crooked trunks result. Repeated weeviling may cause the injured tree to be overtopped by its neighbors. An attempt is being made to develop weevil-resistant spruce.



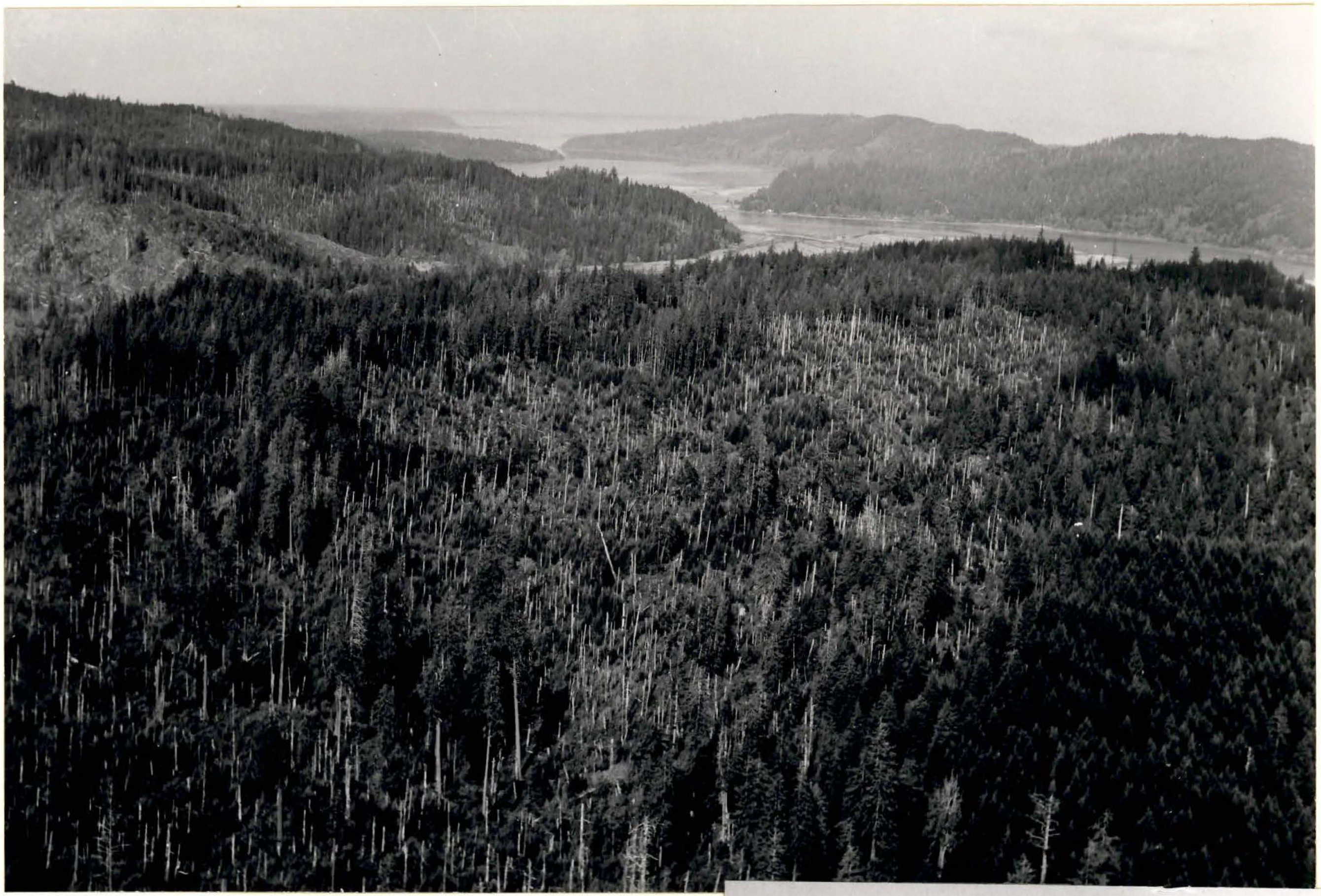
"Leader" of young Sitka spruce killed by the weevil.



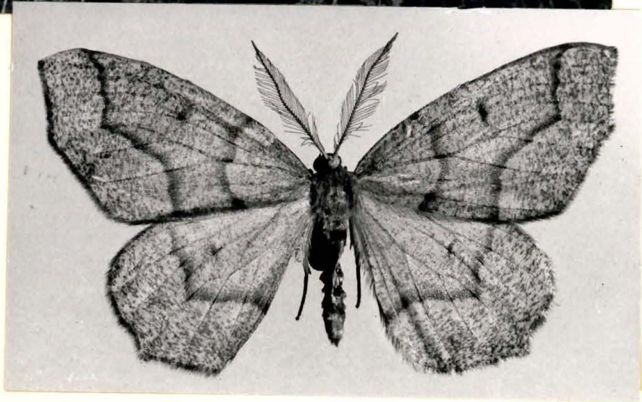
Deformity caused by weeviling.

HEMLOCK LOOPER

Periodically the hemlock looper kills large areas of mature western hemlock in the Pacific Northwest. Outbreaks ultimately are controlled naturally by insect parasites and a virus disease. Much valuable timber can be saved by timely aerial spraying.



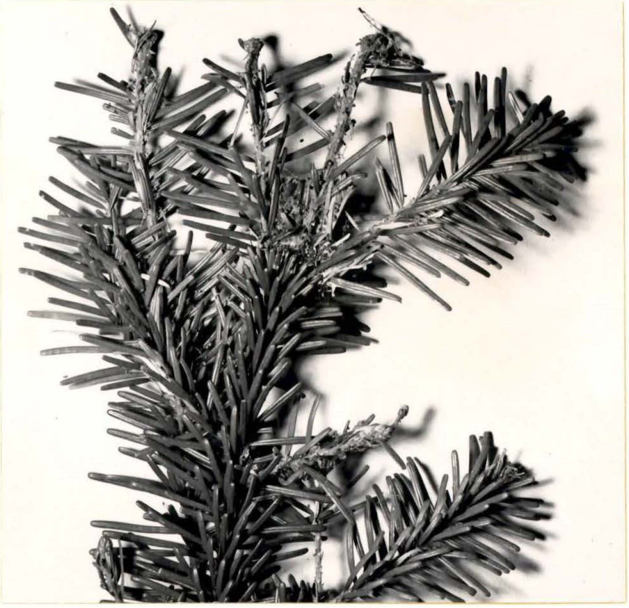
Snag patches in Pacific Co., Wash., created by looper outbreak of 1929-32.



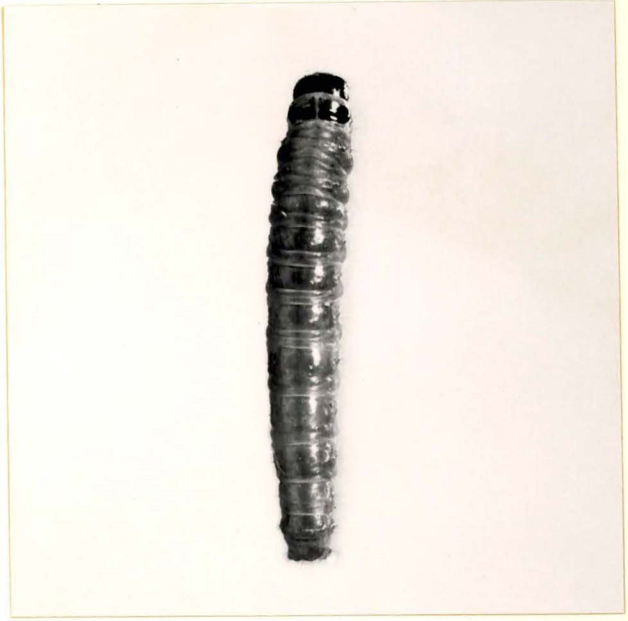
Adult (X 2.5)

BLACK-HEADED BUDWORM

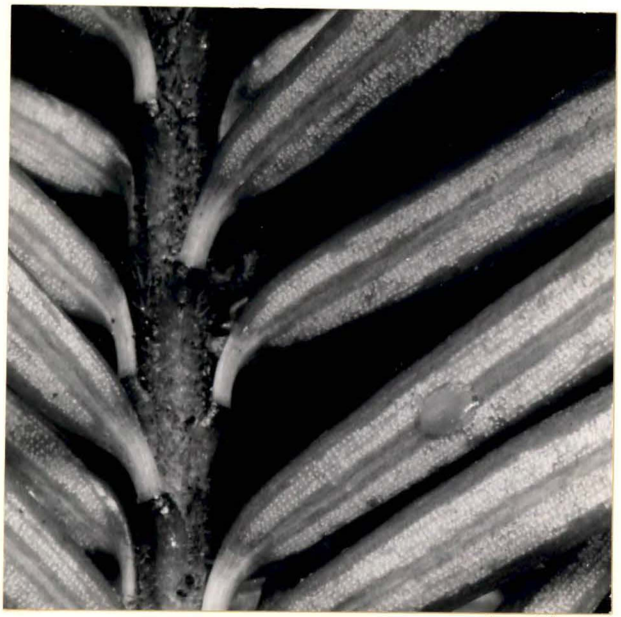
In the Pacific Northwest, the black-headed budworm attacks western hemlock, true firs, Douglas-fir and Sitka spruce. Outbreaks usually last only two or three years. It appears to be most destructive in the northern portion of its range. In British Columbia, aerial spraying with DDT has been effective against the budworm.



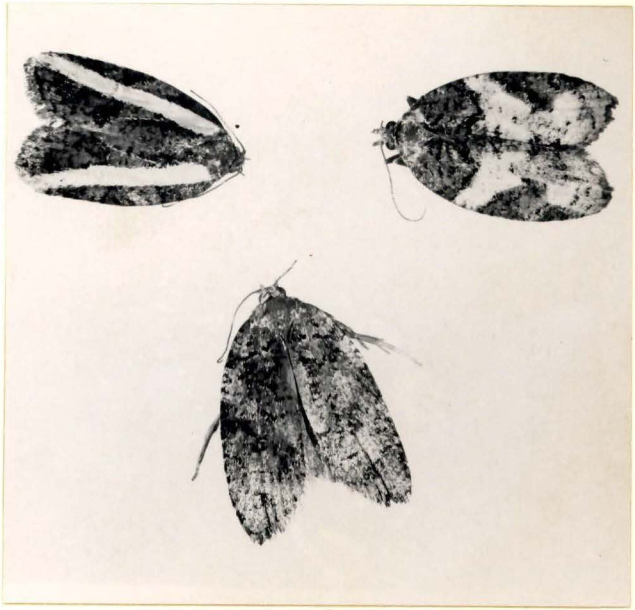
Budworm larvae first feed on the new foliage.



The full-grown larva (X 3) is green with a brown head.

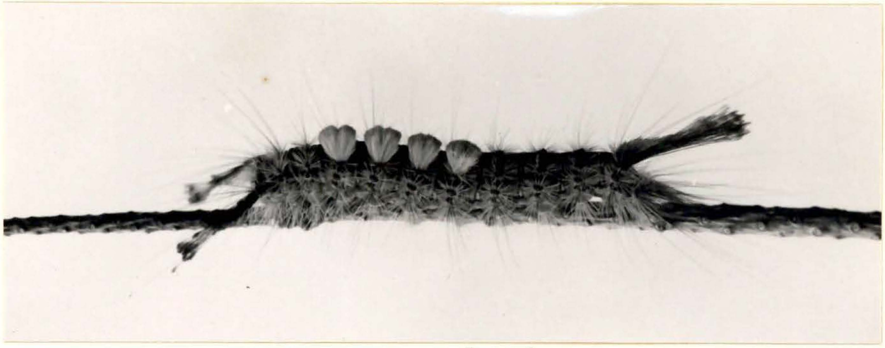


The oval, flattened eggs (X 8) are laid singly on the under surface of needles.



Adults (X 3), showing variety of markings.

DOUGLAS-FIR TUSSOCK MOTH

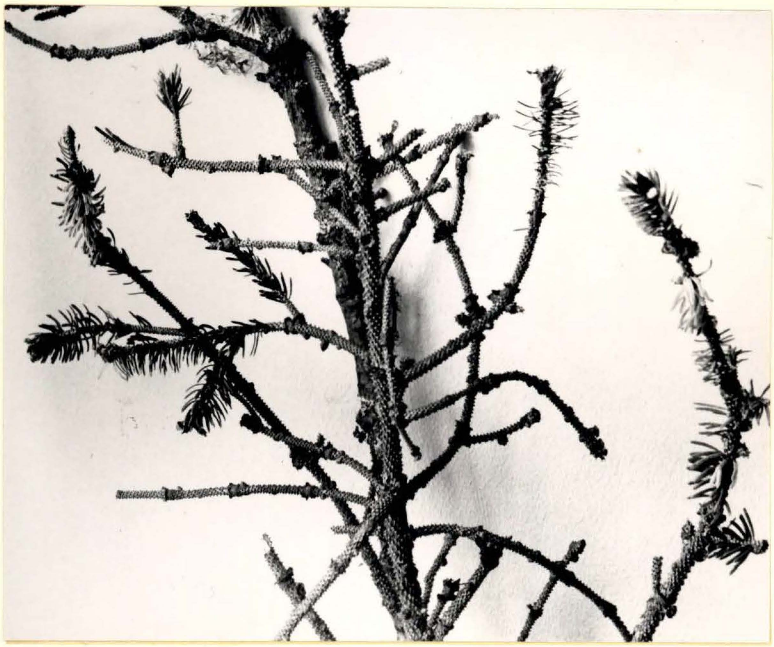


Mature larva (X 3)

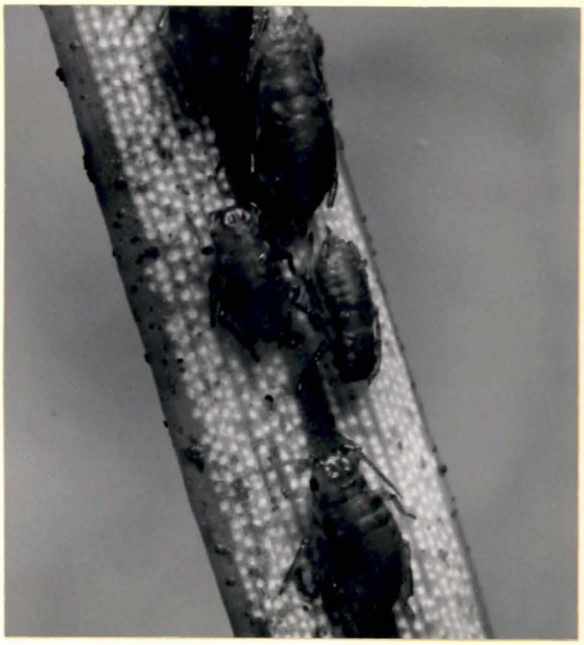
Douglas-fir and true fir understory trees killed by the tussock moth.

The Douglas-fir tussock moth is a serious enemy of Douglas-fir and true firs. Trees are killed outright or are weakened and deformed. The dead and weakened trees provide favorable breeding grounds in which bark beetle outbreaks develop. Aerial spraying with DDT has proven very effective against the tussock moth.

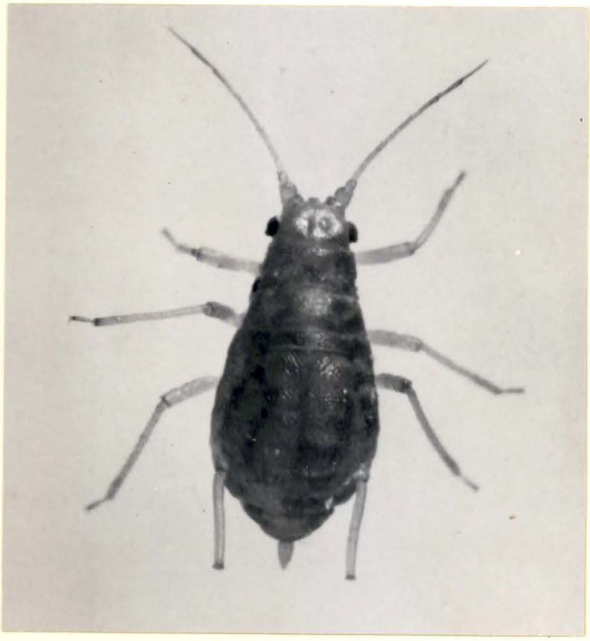
SPRUCE APHID



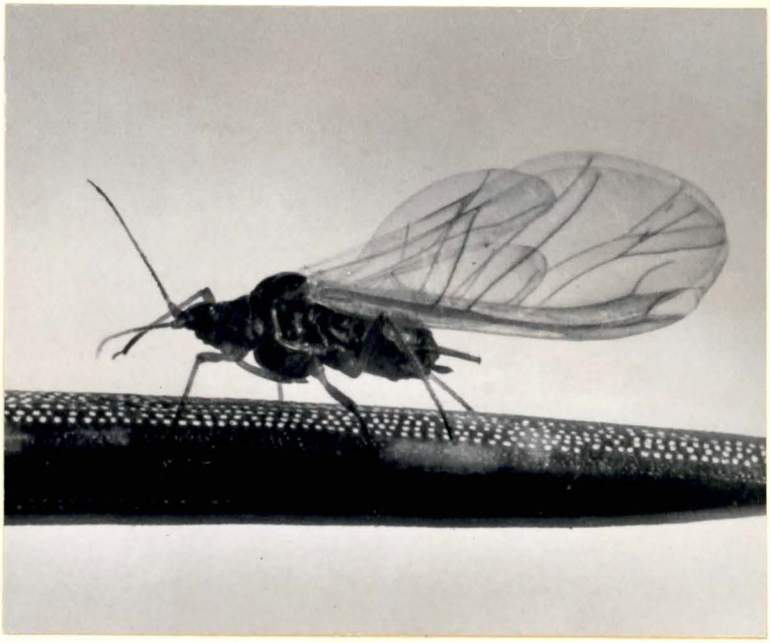
Branch defoliated by the aphid.



Aphid nymphs feeding on spruce needle



Wingless female aphid (X 30).

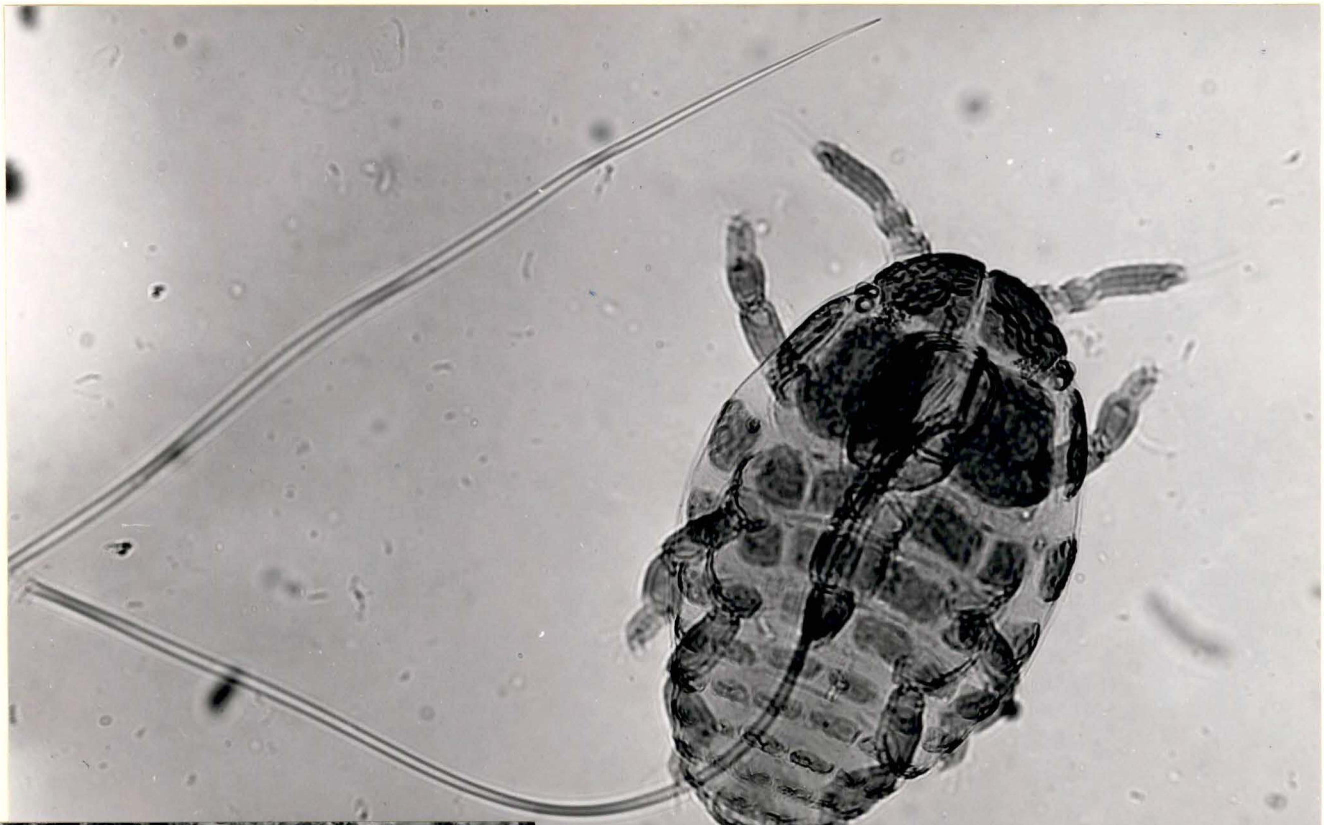


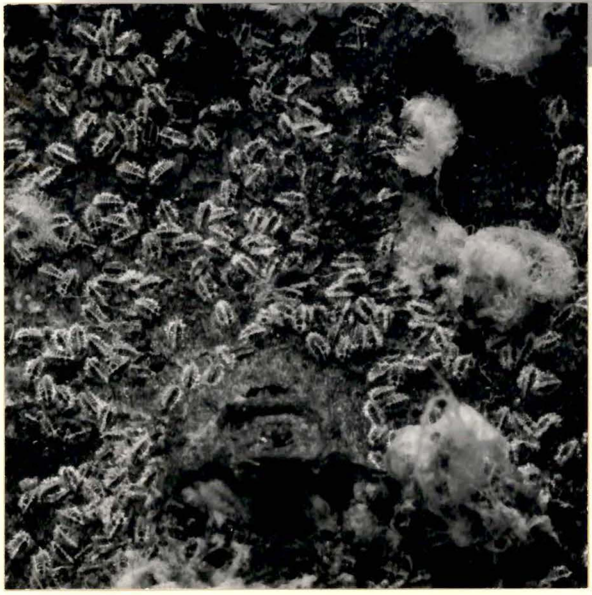
Winged female aphid (X 25).

Periodically the spruce aphid seriously damages Sitka spruce along the coast of Oregon and Washington. The aphid attacks the old foliage only, causing it to turn yellowish and fall. Normally, outbreaks last only 2 or 3 years. No control measures applicable to the forest have been developed.

BALSAM WOOLLY APHID

The balsam woolly aphid, an European insect now widely distributed in Oregon and Washington, is destructive to Pacific silver, subalpine, and grand firs. No practical chemical control measures have been developed.



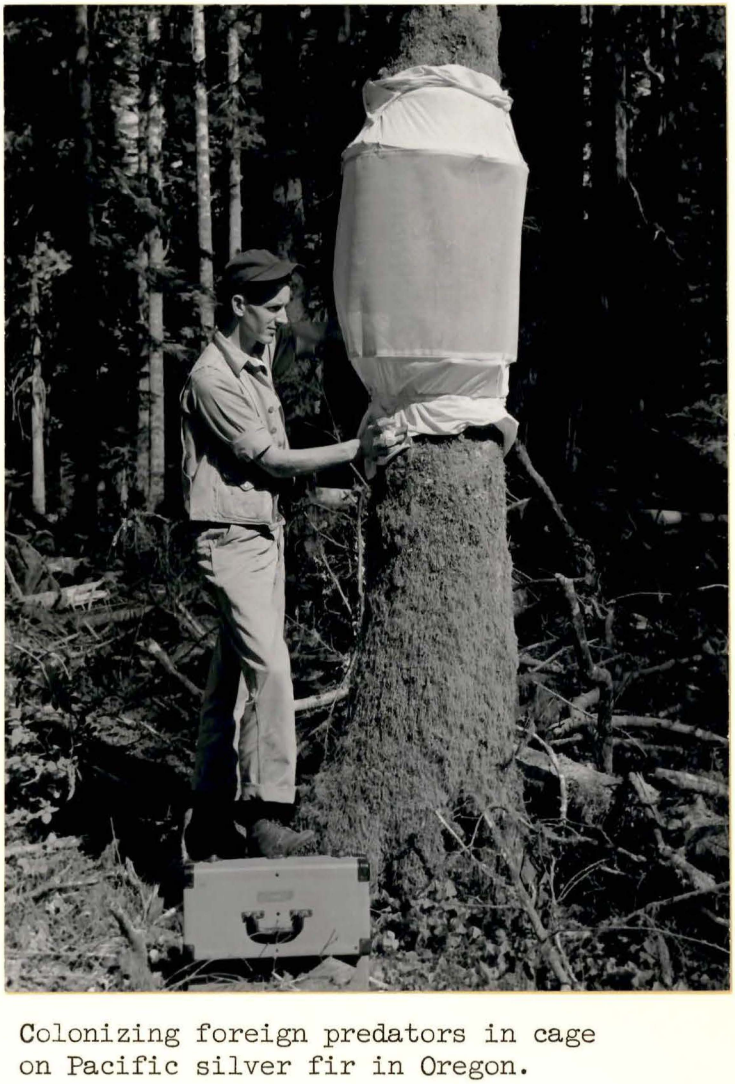


Above - First stage nymph magnified 110 times. Note long tube through which the insect feeds on inner bark.

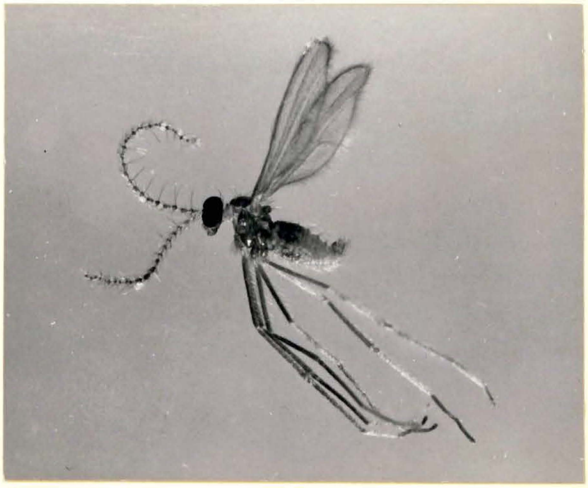
Left - First stage nymphs (6 X) attached to bark.

BALSAM WOOLLY APHID

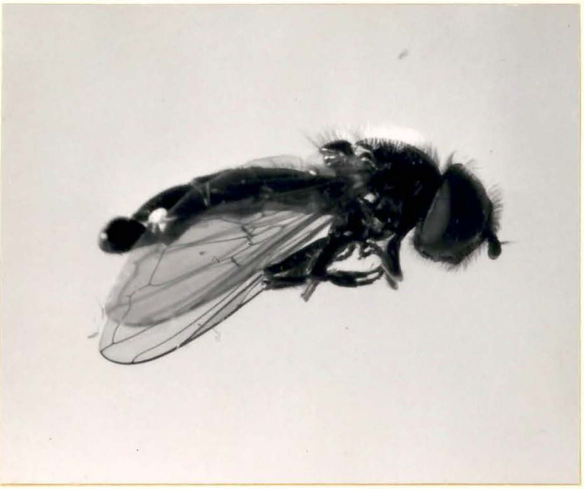
Insect predators are a possible means of controlling the woolly aphid. Native predators are being studied to determine their effectiveness. Foreign predators are being imported and colonized in Oregon and Washington.



Colonizing foreign predators in cage on Pacific silver fir in Oregon.

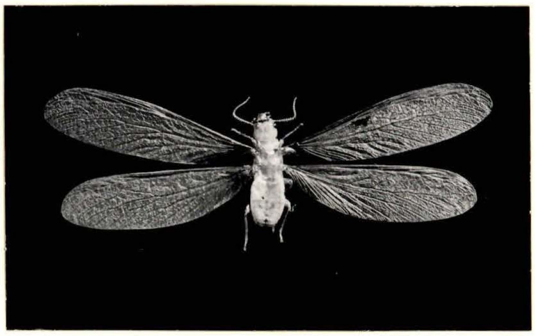


Adult Aphidoletes thompsoni (X 10) from Czechoslovakia.



Cnemedon rita, a common native predator (X 8).

WOOD PRODUCTS INSECTS



Dampwood termite

Ergates

Carpenter ant

Many kinds of insects damage wood products in Oregon and Washington. None is being studied.

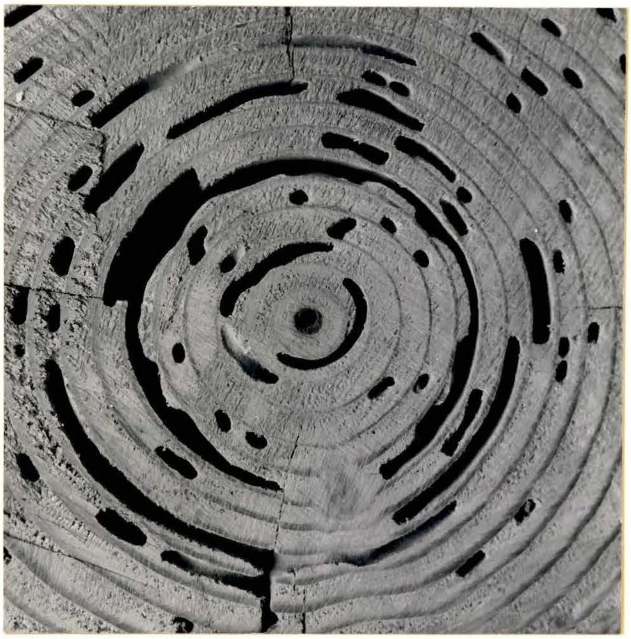
Buprestis

Arhopalus

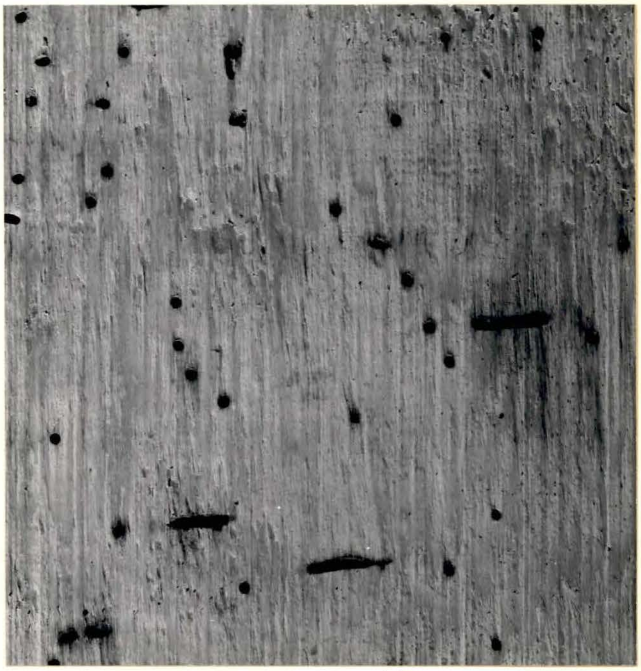
Horntail

WOOD PRODUCTS INSECTS

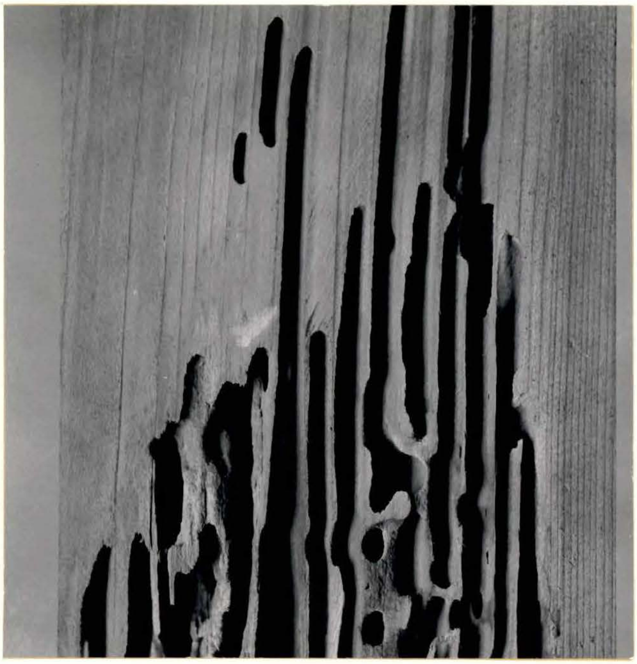
Insects cause extensive economic losses throughout the country by boring in wood products. The damage differs in kind and amount according to the insect species.



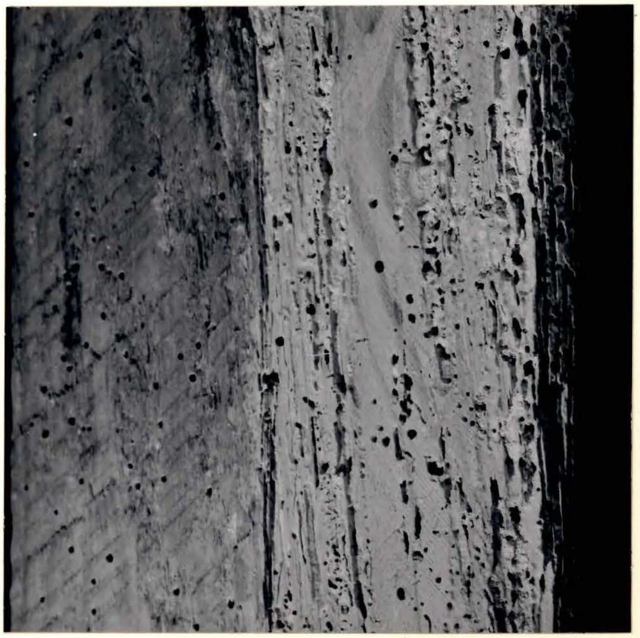
Termites



Ambrosia beetles



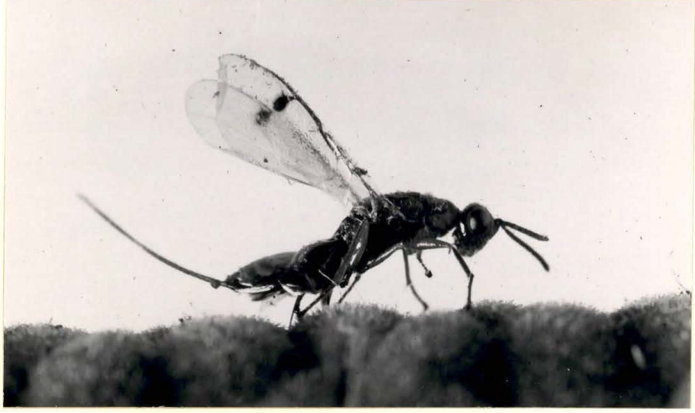
Carpenter ants



Powderpost beetles

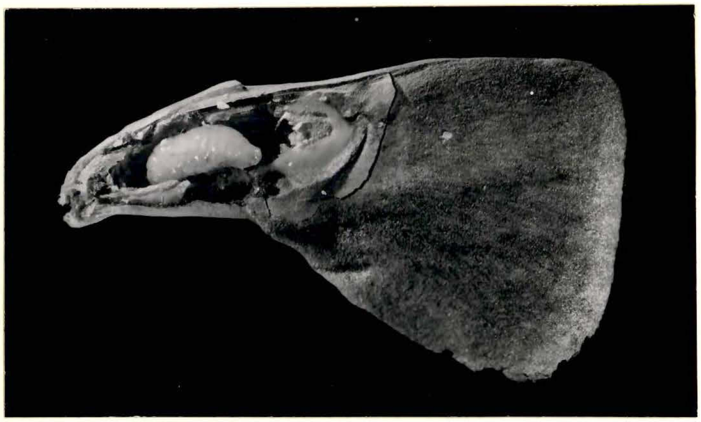
SEED AND CONE INSECTS

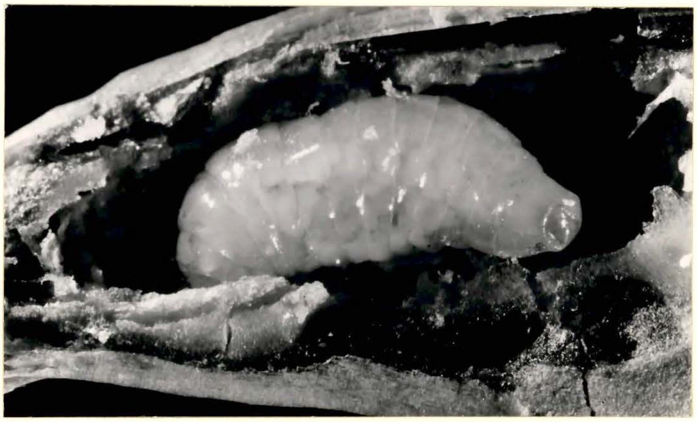
Seeds of forest trees are destroyed by many kinds of insects. Large-scale tree planting and seeding programs and the establishment of seed orchards for quality seeds necessitates insect control. Research is needed to develop effective control measures.



Seed chalcid, Megastigmus pinus, laying egg in white fir cone (X 12).

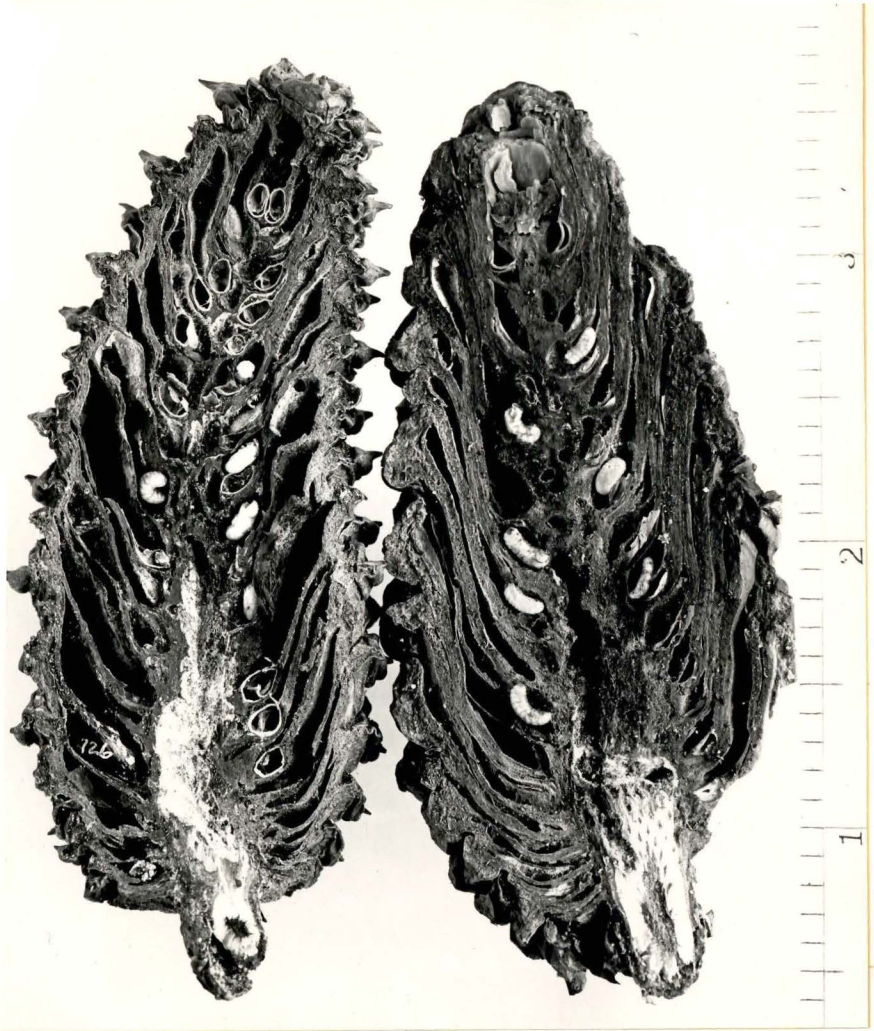
Seed chalcid larva (X 3) in noble fir seed.





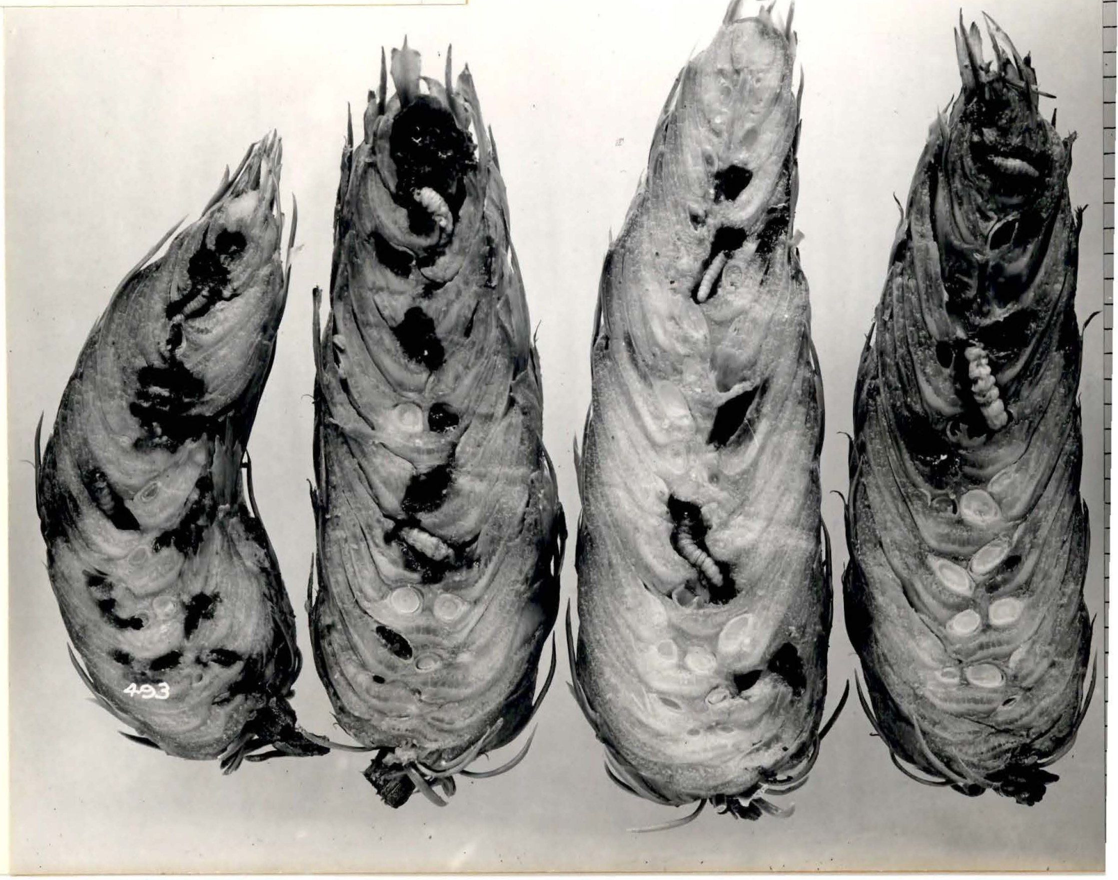
Seed chalcid larva (X 10) in noble fir seed.

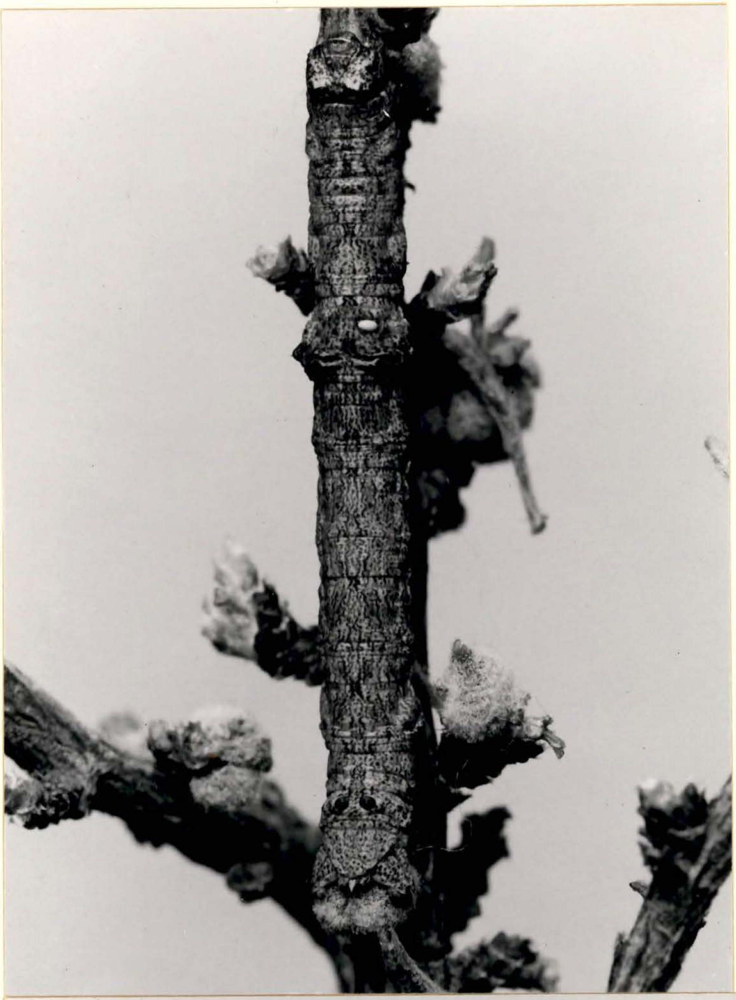
SEED AND CONE INSECTS



Ponderosa pine cones sectioned to show damage by the cone beetle, Conophthorus ponderosae Hopk.

Douglas-fir cones cut open to show damage by the cone moth, Barbara colfaxiana.



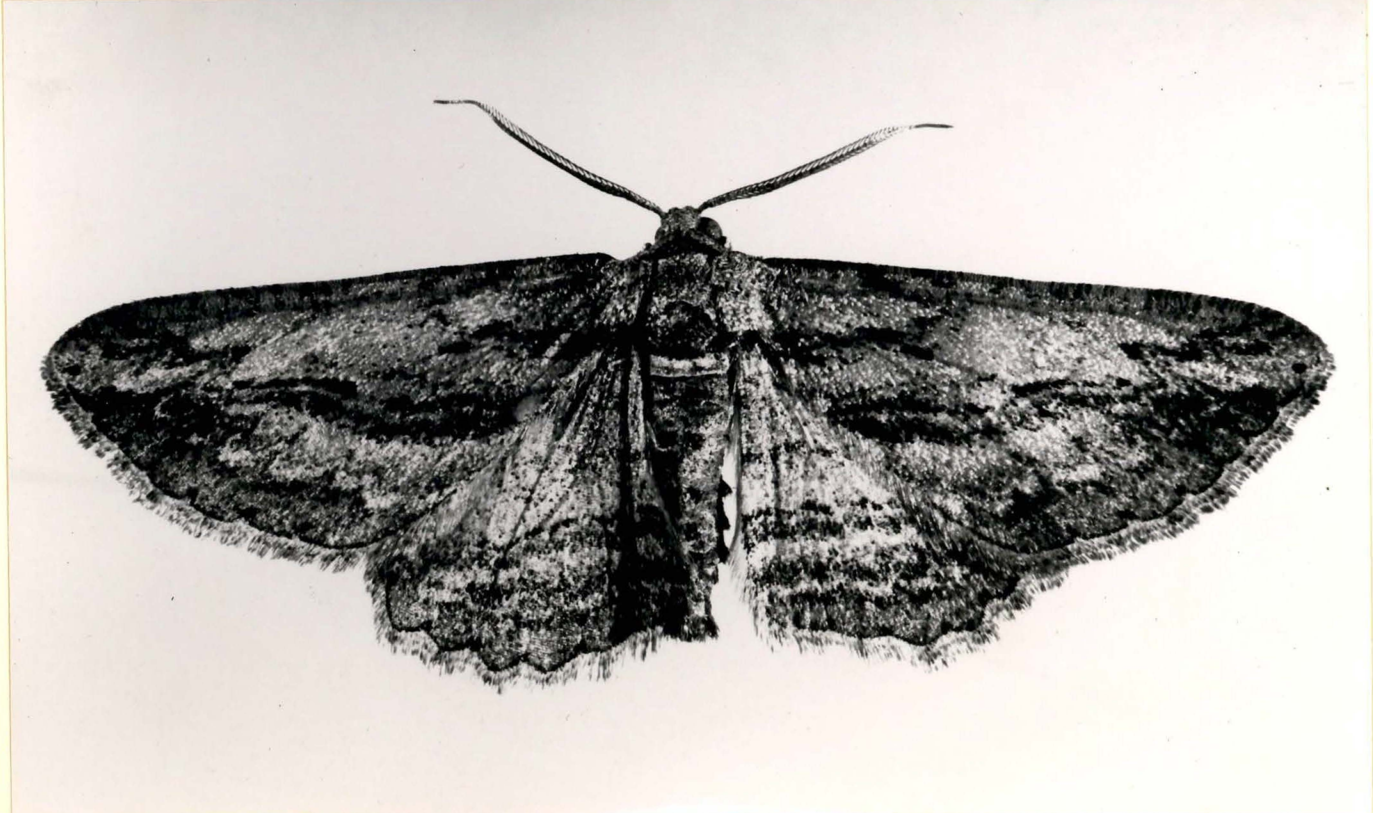


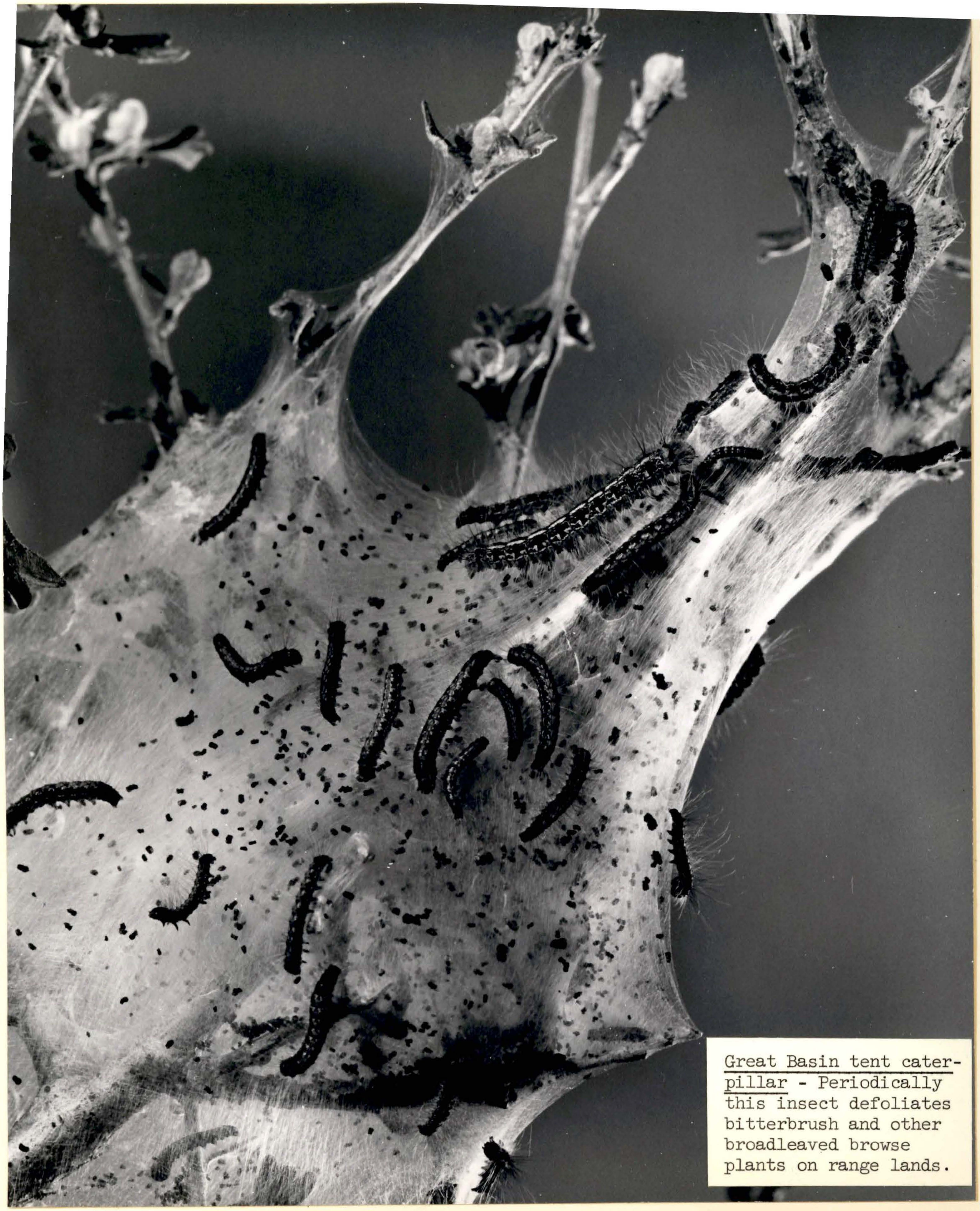
RANGE INSECTS

Many insects feed upon range plants used as food by livestock and wildlife. One of the more important is a looper that kills bitterbrush, a valuable browse plant. Little research has been done on insects attacking forest ranges.

Left - Bitterbrush looper larva (X 3) closely resembles twig of host plant. White spot is egg of parasitic fly.

Below - Adult (X 6)





Great Basin tent caterpillar - Periodically this insect defoliates bitterbrush and other broadleaved browse plants on range lands.